

## REVIEW ARTICLE



# Anatomical Features of the Interscapular Area Where Wet Cupping Therapy Is Done and Its Possible Relation to Acupuncture Meridians

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## Abstract

Although wet cupping has been a treatment for centuries, its mechanism of action is not well understood. Because the anatomical features of the wet-cupping area might play a role in its mechanism, we focus on the features of the interscapular area in which a common type of wet-cupping therapy (WCT), called *Hijamat-e-Aam* in Iranian medicine, is usually applied and discuss the possible relation of those features to the acupuncture meridians. We gathered and analyzed data from reliable textbooks on modern medicine with a focus on the anatomical features of the interscapular area, topics related to WCT in Iranian medicine, and acupuncture sources obtained by searching PubMed, Google-Scholar, and Science Direct. The interscapular area used for WCT was found to have special features: brown adipose tissue, immediate proximity to sympathetic ganglia, passage of the thoracic duct, two important acupuncture meridians, and proximity to the main vessel divisions carrying blood from the heart and the brain. These features indicate that the interscapular application of WCT not only discharges waste materials through a shifting

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of blood to the site after application of a traction force but also invigorates the body's metabolism, increases immunity, and regulates blood biochemistry, which are desired therapeutic effects of WCT.

## 1. Introduction

As the present study is an attempt to shed light on the scientific mechanism of a particular type of wet cupping, called *Aam* or *Kahel* (in Arabic-speaking countries) or *Kahilya* (in India) [1], we should briefly introduce the primary differences between two different types of blood drainage for therapeutic purposes in traditional medicine, namely, wet cupping and phlebotomy. Wet-cupping therapy (WCT) dates back to nearly 3500 BC, and several historical documents are available on its first use among ancient cultures in many parts of Europe and in Eastern countries including Iran [2,3].

Wet cupping is called *Hijamat* in Iran, which comes from the Arabic *Hajm* or *Hajam* meaning expansion, sucking, and bloodletting [3,4]. WCT is a procedure for bloodletting from the capillary networks after sucking and scarification steps [2]. In this procedure, a cup is mostly attached to the surface of the skin by using a negative pressure or suction-like force. A few minutes later, the uplifted cup is removed, and superficial incisions are made using a scalpel. The cup is then replaced, and the procedure is repeated three to five times until some blood and interstitial fluid are drained [2,3,5].

An alternative method for blood drainage for medical purposes is called phlebotomy or venesection (or *Fasd* in Arabic). Unlike wet cupping in which the blood is drained from the capillary network, in this method, the blood vessels, commonly hand veins, are cut with a scalpel, and the blood is directly drained [2]. Phlebotomy is often mistakenly believed to be the same as wet cupping or *Hijamat*, but the two differ in their vessel sources.

In spite of vast traditional and modern usage of WCT, not enough explanation has yet been provided for its mechanism of action. According to *Avicenna*, wet cupping (*Hijamat*, in his own term) acts through two mechanisms: first, blood purification or clearance, especially for the skin and its adjacent organs, and second, thin blood drainage [2,6,7]. These mechanisms have not yet been translated into the language of modern medicine and are tangible only for experts in the concepts of humoral medicine. However, several theories have been proposed to date [8]. Among these, *Taibah* theory by El Sayed et al [8] has a more scientific basis than the others and can explain the "molecular events" of WCT based on modern medical knowledge.

According to *Taibah* theory, WCT is a minor surgical excretory procedure that mimics the secretory function of an artificial kidney. Unlike the normal kidney that filters only hydrophilic materials through the renal glomeruli at normal filtration pressure, WCT can filter both hydrophobic and hydrophilic substances under a higher filtration pressure. Due to the viscoelastic properties of the skin, this high pressure leads to an increase in blood volume and a

reduction of pressure in the area according to the Boyle–Marriott law. This can enhance the capillary's filtration rate and can lead to the accumulation of filtered, as well as interstitial, fluid in the area. Filtered fluid comprises disease-causing and disease-related substances that are drained through scratches without returning to the venous end of the capillary network. Furthermore, scalpel scratches on the skin stimulate endogenous opioid release and inflammatory cell migration to the cupping site and improve innate and acquired immunity. This sequence of events will be completed by the third sucking step.

According to El Sayed et al's [8] theory, WCT decreases the interstitial fluid pressure, capillary venous return, venous pressure, and peripheral vascular resistance. However, it improves blood flow and relieves congestion and swelling by disposing of toxins and waste materials. Prostaglandins and inflammatory mediators are also eliminated. These changes restore neuroendocrine balance and hemostasis, modulate angiogenesis, relieve muscle spasms, and help improve oxygen supply and tissue perfusion [8].

As mentioned above, *Taibah* theory concentrates only on the "molecular events" that occur in any type of wet cupping, which can be applied to different parts of the body for different purposes [9]. However, one type of WCT named *Aam*, applied in the interscapular region, seems to provide additional unique advantages to the entire body due to the distinct anatomical characteristics of the region. That is why it is called "*Aam*," which means "general" in Arabic, while other types of wet cupping affect only the particular region in which the procedure is applied. In Arabic, these types are called "*Khass*," meaning "specific."

The outstanding anatomical features of *Hijamat-e-Aam*, in addition to the molecular mechanisms proposed in *Taibah* theory, may add to the value of wet cupping in the treatment of diseases. Recognizing these features about *Hijamat-e-Aam* can fill more convincing information into the puzzle of the mechanism of action of this type of WCT. Therefore, we hypothesize and discuss in this article the idea that the usual whole-body effects of *Hijamat-e-Aam* occur due to the adjacent anatomical organs and histological properties of the skin at the site of the therapy, i.e., the interscapular area, which is a perfect site for this type of WCT.

## 2. Materials and methods

This study was carried out based on the basics of Iranian Traditional Medicine through scanning reliable sources such as *The Canon of Medicine* by Avicenna (10<sup>th</sup> century and 11<sup>th</sup> century), *The Summary of Wisdom* (Kholāsa Al-Hekma) by Mohammad Hossein AghiliKhorasani (18<sup>th</sup> century), and *Moffarah Al-Gholoub* by Muhammad AkbarArzani (late 17<sup>th</sup> century and early 18<sup>th</sup> century). The keywords included

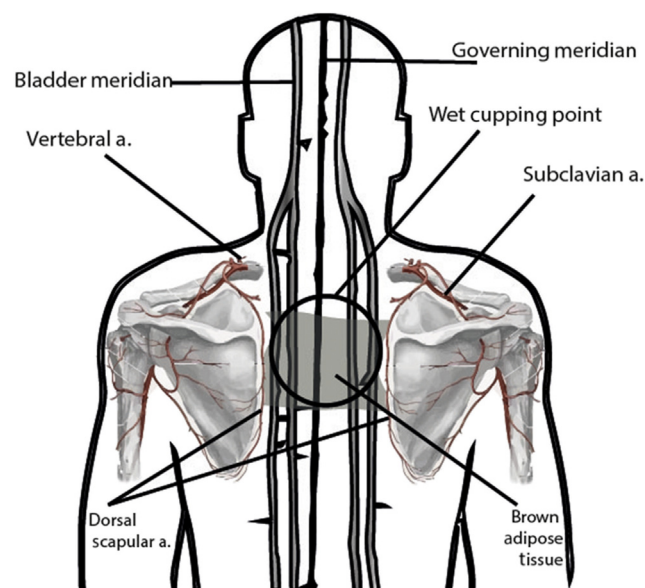
WCT, *Hijamat*, *Hijama*, *Hacâmat*, *Hicamat*, *Al-hijamah*, bloodletting, phlebotomy, venesection, and *Fasd*. In addition to our focus on the traditional sources of information, the most related and reliable textbooks on modern medicine were also probed while concentrating on the anatomical features of the interscapular area. Textbooks on Chinese medicine were carefully studied to explain the meridians and the acupuncture points in the area, including their functions and characteristics. Reliable articles on topics related to wet cupping were also searched in the reputable databanks of PubMed, Google Scholar, and Science Direct by using keywords including the anatomy and histology of the interscapular region, WCT mechanism, and back meridians. Data extraction was performed from November 1, 2014 until May 15, 2015.

### 3. Results

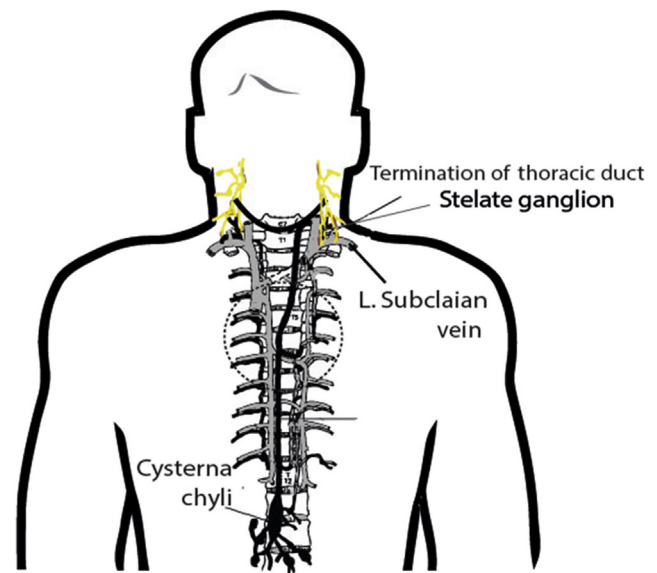
Our findings indicate that the interscapular site has special features due to the anatomical organs adjacent to it and to the histological properties of the skin in that area. These characteristics are described in the following subsections.

#### 3.1. Brown adipose tissue, sympathetic ganglion, and innervation

Brown adipose tissue (BAT) or brown fat is located on the upper back of the chest and neck and toward the shoulders (Fig. 1) [10]. Thus, BAT is located in the interscapular area or *Aam* region. The stellate ganglion is a sympathetic ganglion located anterior to the first rib near the C<sub>6</sub> level (Fig. 2) [11]. *Hijamat-e-Aam* is usually applied at the T<sub>2</sub>–T<sub>5</sub> vertebrae [12], which are near the stellate ganglion.



**Figure 1** Schematic view of the anatomical features of the interscapular area used in wet-cupping therapy (back). a = artery.



**Figure 2** Schematic view of the anatomical features of the interscapular area used in wet-cupping therapy (front). L. = left.

#### 3.2. Thoracic duct and blood supply

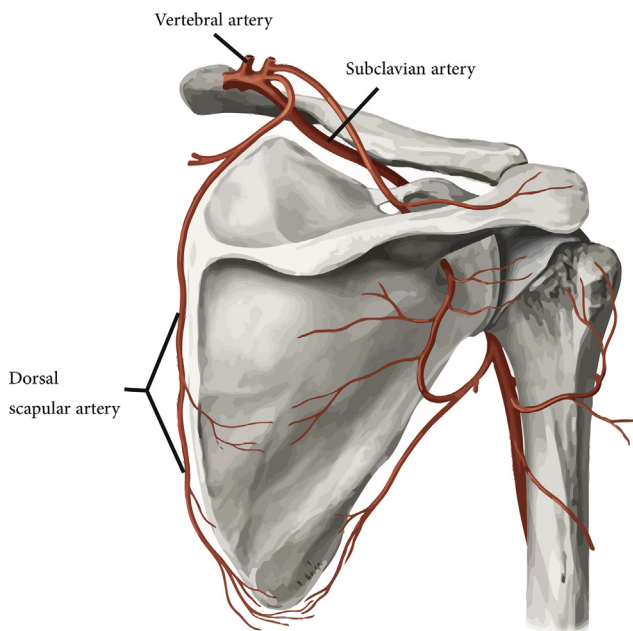
The thoracic duct originates from the “*Cysterna Chyli*,” a saccular dilatation of the lymphatic vessel that drains lymph from the viscera, abdominal wall, pelvis, peritoneum, and lower extremities at the level of L<sub>2</sub> and carries it to the root of the neck. This duct deviates to the left in front of T<sub>5</sub> and finally drains into the internal jugular at the subclavicular vein’s junction (Fig. 2) [13,14].

As for the blood supply, the capillary network in the interscapular region is made up of the dorsal scapular artery, which originates from the subclavian artery, a main branch of the aorta. On the other side, the vertebral artery, which supplies the base of the skull, also originates from the subclavian artery (Fig. 3) [13]. Thus, this area acts as a connecting bridge between the brain (base of the skull) and the heart (aorta).

#### 3.3. Acupoints

To acupuncture points, *Hijamat-e-Aam* is applied to certain acupuncture points of the bladder and the governing channel. The Bladder meridian, as one of the most important and longest channels in Chinese medicine, has two important routes on each side of the back. Thus, when the governing vessel is added, five acupuncture channels pass through the interscapular region.

The urinary bladder channel (BL 1–67) originates from the inner corners of the eyes, passes through the forehead or vertex, and divides into two lines above the posterior hairline. One line goes downward 3 *Cun*, which is the same as the width of the closed index, middle, ring, and little fingers, along the medial border of the scapula on the level of the proximal interphalangeal crease of the middle finger lateral to the back midline. The other line runs straight downward, 1.5 *Cun*, which is the same as the width of the



**Figure 3** Blood supply in the interscapular region.

closed index and middle finger, lateral to the midline of the back. Both lines then descend to the posterior aspect of both thighs and legs and to the posterior inferior aspect of the lateral malleolus and finally end at the lateral parts of the fifth toes of the feet [15].

BL 12–15 are near the interscapular site for WCT. Moreover, some important back-*shu* points, including the heart back-*shu* point, which according to Chinese medicine theory is famous for vitalizing the whole body, are located in the *Hijamat-e-Aam* region. Points BL 13 to BL 15 are related to the lungs, pericardium and heart, respectively, and in acupuncture theory are used to promote, regulate, and strengthen these organs. Points BL 41 to BL 46, which are also located in the interscapular region, are all warm points that can be used to block pain and restore good energy.

The Governor Vessel (GV; DU 1–28) starts from the tip of the coccyx and the anus when the patient lies in the prone position. It then goes upward inside the spinal column to the nucha, vertex, forehead, and bridge of the nose and ends at the upper lip (Fig. 1) [15]. The GV plays an important role in balancing *qi*, blood, and body fluids and in maintaining health. Points GV9 to GV13, which are again regulating, balancing, and improving points, are mainly used for treating general pain and for balancing lung *qi*. Stimulating these points can regulate and facilitate the flow of *qi* along the Bladder meridian and the GV, which then leads to better circulation of *qi* throughout the entire body.

### 3.4. Connective tissue lines

Two spiral fascial lines cross exactly in the middle of the interscapular area. In addition, two back vertical lines pass through this region. New studies have shown the importance of fascial lines in keeping the balance

between the muscles. Also, in recent years, many studies have shown the possibility that some acupuncture meridians follow the same routes as the main fascial lines, and this accordance has been used to describe the functions of acupoints and meridians [16]. Dr Helene Langevin was the first to show that acupuncture meridians ran along the routes of connective tissue in the hand [17]. Because these pathways are distributed over the entire body, physical or chemical changes caused by the application of interscapular WCT may have an influence on the whole body.

## 4. Discussion

According to our findings, the specific region of *Hijamat-e-Aam* has six important features. These features include the availability of BAT (Fig. 1), the proximity to the sympathetic ganglia (stellate ganglion) and the thoracic duct (Fig. 2), the proximity to the main vessel divisions carrying blood from the heart and the brain (Fig. 1), the passage of five important channels of acupuncture, which are two lines of the Bladder meridian on each side and the governing channel (Fig. 1), and the passage of two spiral and two vertical connective tissue lines. Regarding the presence of brown fat tissue under the cupping area in the interscapular region, the knowledge that two types of adipose tissues—BAT and white adipose tissue, respectively—exist in mammals is important [10]. Unlike white adipose tissue, which forms a single fat droplet in each cell, BAT shapes a large number of tiny fat droplets and a large number of ferruginous mitochondria with a brown hue. As mitochondria form the energy source for most body cells through oxidative phosphorylation of fatty acids and ketones [18], BAT can play an important role in balancing energy production in patients undergoing *Hijamat-e-Aam*.

Apart from the usual feature of any kind of WCT in discharging waste materials by shifting blood to the site as a result of the application of a traction force [5], another advantage of the interscapular region for *Hijamat-e-Aam* is that BAT with its large number of capillaries, which can attract considerably more blood to the site, is located in the skin of the interscapular region [18]. Furthermore, because the low blood velocities in capillaries [19] make them proper points for the deposit of waste materials, the application of wet cupping in the interscapular region with its rich capillary network can result in the elimination of more excess accumulated materials than other types of wet cupping can. This is in agreement with the findings of El Sayed et al's [18] study. They explained how WCT at the interscapular region has an iron overload-reducing effect [20].

Short-term exposure to cold is generally known to be able to activate BAT, culminating in the absorption of triglyceride-rich lipoproteins [10]. Wet cupping, likewise, if applied to the interscapular skin, may act as a BAT stimulator and play a role in the clearance of plasma lipids. This finding agrees with the results of recent studies on the lipid-lowering effect of *Hijamat-e-Aam* [21,22]. Some studies have shown that activating the cyclooxygenase system, which is induced by an inflammatory process, can



also activate adipose tissue. Thus, the inflammation caused by WCT may be effective in activating adipose tissue [23].

The sympathetic system prepares the body for emergency situations like fear, anger, and intense muscular activity during exercise. It narrows the arterial wall and increases the blood pressure and the heart rate. Sympathetic innervation of the interscapular region can confirm *Hijamat-e-Aam*'s impact on organs like the heart, cardiac valves, coronary vessels, rib cage, breast tissue, bronchial tubes, pulmonary tissue, diaphragm muscle, solar plexus, liver, and gallbladder [13]. The proximity of the stellate ganglion to the interscapular region may bring it to a relaxed state following a shock induced by skin suction and scarification. Our experiences in traditional-medicine clinics show that patients generally feel comfort after *Hijamat-e-Aam* therapy, probably due to special neurologic routes [8,24].

The blood pressure-lowering effect of *Hijamat-e-Aam* [25] might be related to its impact on the sympathetic system, which innervates the interscapular area. According to reliable sources in Iranian Traditional Medicine, such as The Canon of Medicine, the interscapular region of *Hijamat* has been recommended especially for treating cardiac dysrhythmia, called *Khafaghan* in the Arabic language [2]. This is in agreement with recent findings about the cardioprotective and the antiarrhythmic effects of *Hijamat-e-Aam*, as well as its influence on the resolution of sympathovagal imbalances [24]. This confirms WCT impacts on main organs such as the heart, and this is in line with our above-mentioned idea, although more research is needed to verify this hypothesis.

The lymphatic duct is located along the spine and is in line with the arteries, veins, and nerves. The thoracic duct is the main lymphatic channel gathering most of the body's lymph and returning it to the venous system. Activation of the immune system after WCT may be mediated through lymphatic tissues. Ahmad Mohammad Khalil et al [26] stated that wet cupping seemed to activate the complement system and the cellular part of the immune apparatus. Another study showed that *Hijamat-e-Aam* had a modulatory effect on the innate natural killer cells and adaptive cellular immune responses [27]. These findings need to be confirmed by ongoing research. The interscapular region includes both the left and the right lymphatic drainage systems, and cupping before and after the incision gives rise to a negative pressure and promotes lymph circulation.

Investigations on the blood supply at the interscapular site have shown that the brain and the heart are two main organs that are closely related to the capillary network of the vascular system of the interscapular region [13]. Thus, sucking, scarifying, and draining blood from the site may protect these organs against accumulation of waste materials or blood stagnation.

One of the cardinal points of the BL meridian BL 17, which is associated with blood and blood chemistries, is located next to the interscapular site [15]. As mentioned earlier, *Hijamat-e-Aam* has blood-, iron-, and lipid-lowering effects [20–22]. Furthermore, some articles on the effect of this type of WCT on blood parameters [12,28], such as glucose reduction in diabetic patients [29] and other changes of blood chemistries after the therapy, have been

published. These findings may demonstrate meridian activation and unblocking. Stimulating the meridians provokes special effects in the human body. Based on Chinese medicine, WCT can release trapped energy (*Qi*) in the channels and can help it flow correctly [8].

Like BL 17 and GV 14, one of the cardinal points of the governing channel, is also located next to the interscapular site below the spinous process of C<sub>7</sub> [15]. Unblocking this point, which is associated with general energy excess, may balance the functions of all body organs. Clearly, more investigations are needed to clarify every facet of activating the functions of the BL and the GV cardinal points during WCT applied to the interscapular area. Worth mentioning is that stimulation of any point of a meridian can unblock the entire channel, which may affect all the cardinal points located on that channel. This, in turn, enhances the normal functions of all associated organs and may provide justification for the comprehensive therapeutic effects of *Hijamat-e-Aam* in the treatment of patients with different diseases with different pathologies.

Finally, an important point seems to be that the accumulation of all the above features in one region of the body, the interscapular region, may bring about therapeutic effects through several mechanisms. Although other areas of the body may have one or more of these six features, even with better quality, because of its anatomical position, the interscapular area includes several effective and controlling systems, which is the most prominent advantage of this region. This region's characteristics, as described above, make it a strategic and critical location for bloodletting and the removal of waste materials that have accumulated in the capillary network and may help researchers to have a better understanding of *Hijamat-e-Aam*'s mechanism of action.

## 5. Conclusion

WCT in the interscapular region, which is called *Hijamat-e-Aam* in Iranian traditional medicine, is the most prescribed WCT with a wide range of indications. It is usually administered for general conditions such as enforcing the whole body energy, increasing general immunity, and regulating blood circulation and content, as well as for preventive reasons.

BAT in the interscapular area can play an important role in balancing energy production in patients undergoing *Hijamat-e-Aam*. This adipose tissue plays a central role in the metabolic function, especially in energy homeostasis. BAT is not a mere mass of adipocytes, but a highly complex structure filled with complicated networks of circulatory systems, such as blood vessels, lymph vessels, and primo vessels. The primo vascular system, which is a recently found circulatory system, contains fluid whose proteomic analysis showed remarkably high levels of carbohydrate metabolic derivatives [30,31].

Because of the rich capillary network in the interscapular region, WCT therapy in that region may allow more accumulated excess materials to be eliminated compared with other types of wet cupping. Thus, WCT in the interscapular region may act as a BAT stimulator and play a role in the clearance of plasma lipids. The location of the

interscapular region close to the main lymphatic ducts may explain how wet cupping at the interscapular region can regulate and increase immunity by increasing lymph circulation and drainage.

The Bladder meridian, as one of the most important and longest channels in Chinese medicine and acupuncture, has two important routes on each side of the back. Thus, with the GV, five acupuncture channels pass through the interscapular region. Moreover, some important back-*shu* points, which according to Chinese medicine theory are famous for vitalizing the whole body and which include the heart back-*shu* point, are located in the *Hijamat-e-Aam* region. Stimulating these points can regulate and facilitate the flow of *qi* along the Bladder meridian and the GV, which then leads to better circulation of *qi* throughout the entire body.

Knowing the features of the interscapular area can reduce the ambiguities regarding *Hijamat-e-Aam*'s mechanism of action and account for the therapeutic effects of this type of WCT. Maybe in the future, scientists, by considering the anatomic features of the *Hijamat-e-Aam* region, will be able to define more precisely the mechanism of WCT in which both the molecular events mentioned in *Taibah* theory and the anatomic characteristics of the region to which WCT is applied are considered. We hope our findings will provide other researchers with convincing scientific justifications for the therapeutic effects of WCT, which may result in enhancing human health through recommended traditional medicine and complementary medicine treatments.

## Disclosure statement

The authors declare that they have no conflicts of interest and no financial interests related to the material of this manuscript.

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